Strategic Plan
Risk Assessment Program for Dam Safety (2008 – 2011)

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Draft 4, 10-07-08, John Yen

Purpose of the Program

- The SCE Dam Safety Risk Assessment will enable Dam Safety Engineering and Hydro Generation Management to better manage the hydro facilities, including dams, to protect public safety, and to meet the environmental, and the regulatory requirements, and to maintain reliable hydro power generation.

Foundation of the Program – PFMA

- SCE completed the PFMA for all high hazard dams in 2005, 2006 and 2007.
- The PFMA findings will be summarized into a tabulated format. It will include PFM categories, types of dams, cause of failures, total failure vs. partial failure, and preliminary assessment of consequences due to each failure.

Goals of the Program

- Prioritization of dam safety programs
  First Round & Second Round

- Establish “Performance and Risk Based Design Criteria” (PRBDC) for evaluating safety of dams

- Useful tool for future GRC and budgeting in Power Production.

Review available "Risk Assessments" documents by other organizations in hydro generation business.

- FEMA Documents
- USBR Documents
- USBR Case Studies
- Risk study by BC Hydro
- Risk Studies by Dr. David Bowles, Utah State University
- Report by Larry Von Thun

Establish a work plan for the Program

1. Summarize and review the PFMA results for all SCE dams
2. Conduct Phase I - Simplified Risk Assessment (Qualitative approach) – samples
3. Establish (first round) priority of dams for various dam safety programs – sample
4. Conduct Phase II – Full Risk Assessment, including review of Fragility Analyses of selected dams. (Quantitative approach for selected dams)

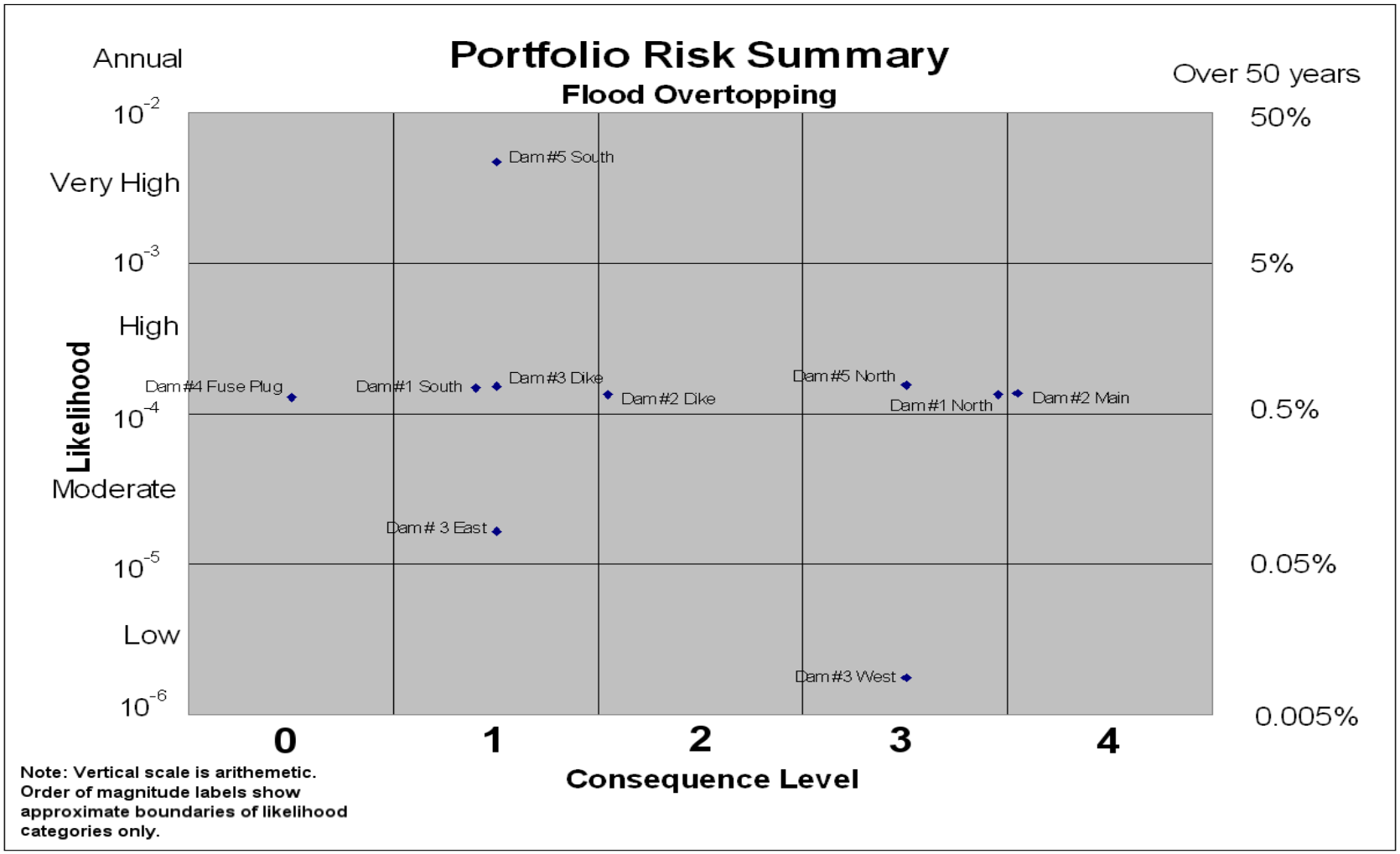
Example of Qualitative Risk Assessment

LIKELIHOOD OF FAILURE	CONSEQUENCES OF FAILURE			
	NO SIGNIFICANT CONSEQUENCES	LEVEL 1	LEVEL 2	LEVEL 3
HIGH	Action may be appropriate to maintain agency credibility	Long term risk reduction action may be appropriate	Long term risk reduction action likely appropriate	Immediate action likely required
MODERATE	Monitoring may be appropriate to maintain agency credibility	Long term risk reduction action may be appropriate	Long term risk reduction action may be appropriate	Long term risk reduction action likely appropriate
LOW	No further action needed	Long term risk reduction action may be appropriate	Monitoring is appropriate risk management activity	Long term risk reduction action may be appropriate
RULED OUT	No further action needed	Long term risk reduction action may be appropriate	No further action needed	No further action needed

Results of Qualitative Risk Matrix

LIKELIHOOD OF FAILURE	CONSEQUENCES OF FAILURE			
	NO SIGNIFICANT CONSEQUENCES	LEVEL 1	LEVEL 2	LEVEL 3
HIGH				
MODERATE		PFM # 4 – Rise in groundwater results in flotation of stilling basin		
LOW			PFM #1 – Rupture of gate during the earthquake PFM #2 – Slow seepage erosion PFM #3- Rise in groundwater triggers slope instability	
RULED OUT			PFM #6 – Rapid seepage erosion PFM #7 Drainage plugs leading to slope instability	PFM #5 – Earthquake triggers slope instability

Results of Semi-Quantitative Risk Analysis



Establish a work plan for the Program

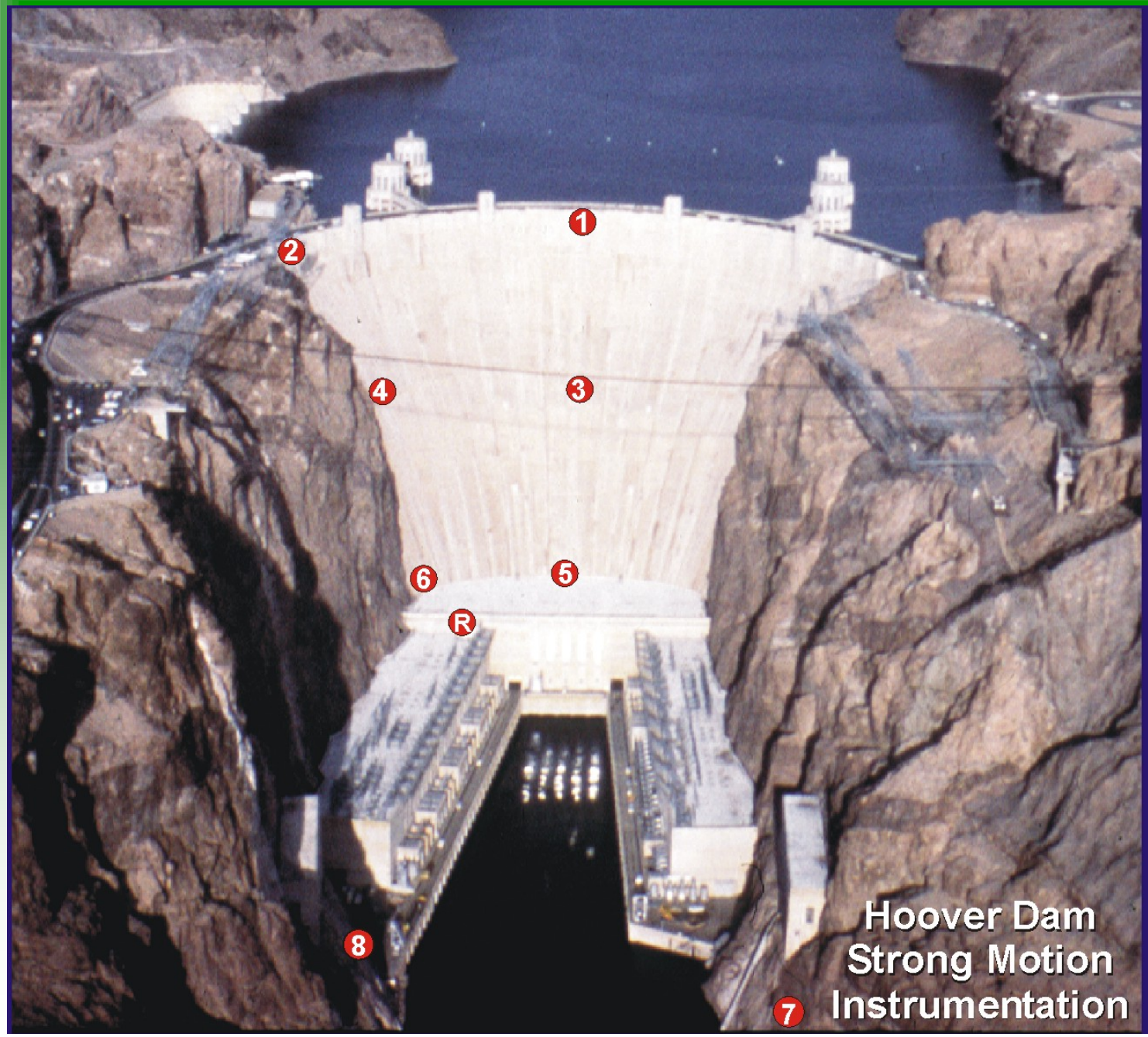
5. Establish Second Round Priority of Dams for Retrofit Projects
6. Develop “Performance and Risk Based Criteria” (PRBDC) based on Risk Assessment.

Application of Risk Assessment on Dam Safety Programs

- Seismic Program (on-going)
- PMF (on-going)
- SMP/SMR Improvement Program (on-going)
- Seismic Instrumentation & Communication Improvement (new) – samples
- EAP Improvement Program
- Retrofit Projects for dams
- Periodic review the program with the regulatory agencies, i. e. FERC, DSOD, etc.

Sample – USBR Seismic Instrumentation Goals

- Improve emergency response
  - Detect loadings that may lead to failure
  - Provide timely information for decision making
  - Maximize response and warning time
- Manage long-term risk
  - Provide data for earthquake engineering analyses
    - Site response measurement
    - Empirical Green's Function
    - Site-specific design ground motions
    - Structural response
  - Validate performance and assumptions
  - Further the understanding of earthquake hazards



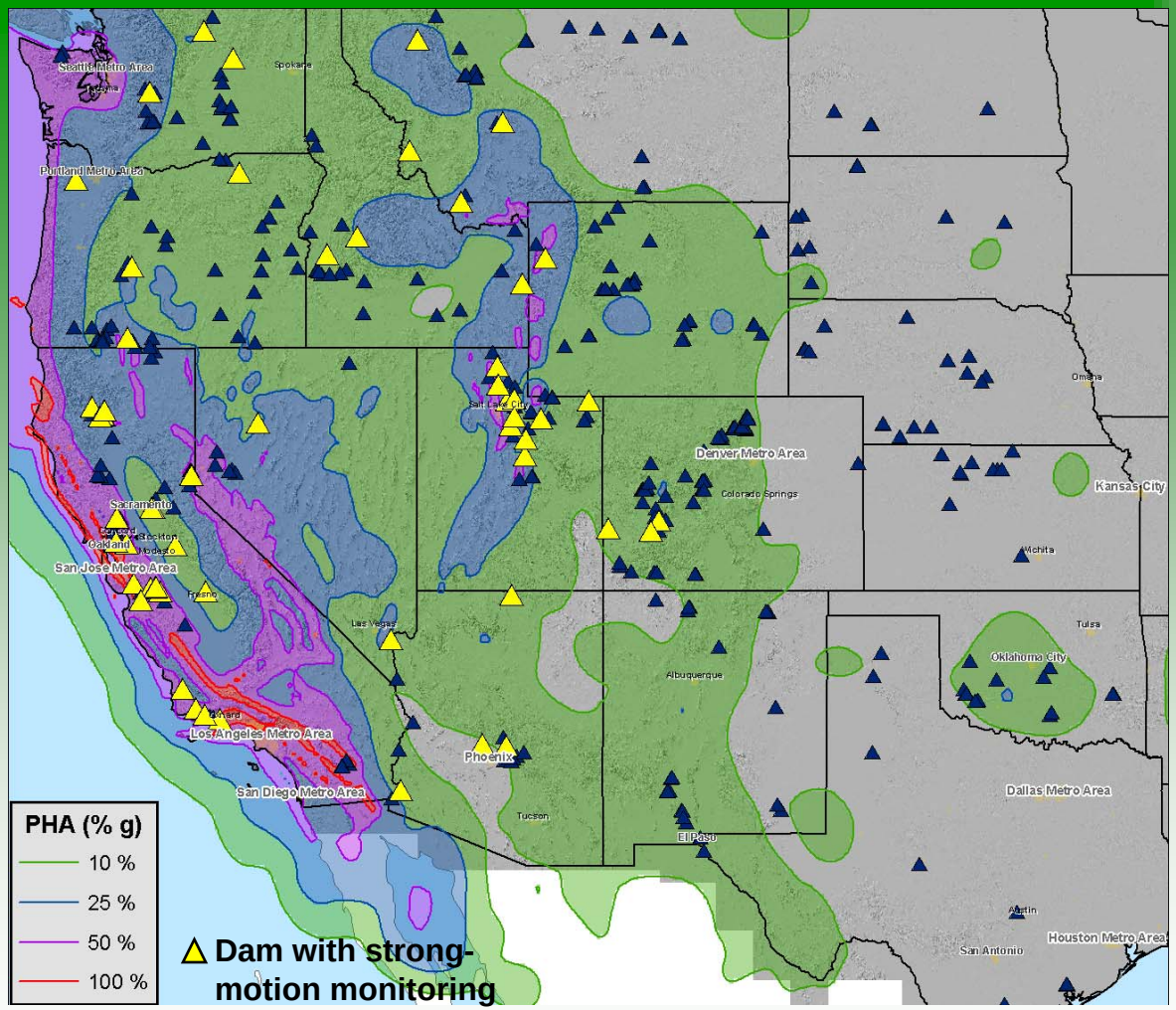
LEGEND:

1 – 8
FBA -23

R
Central recording location

Reclamation strong-motion dams

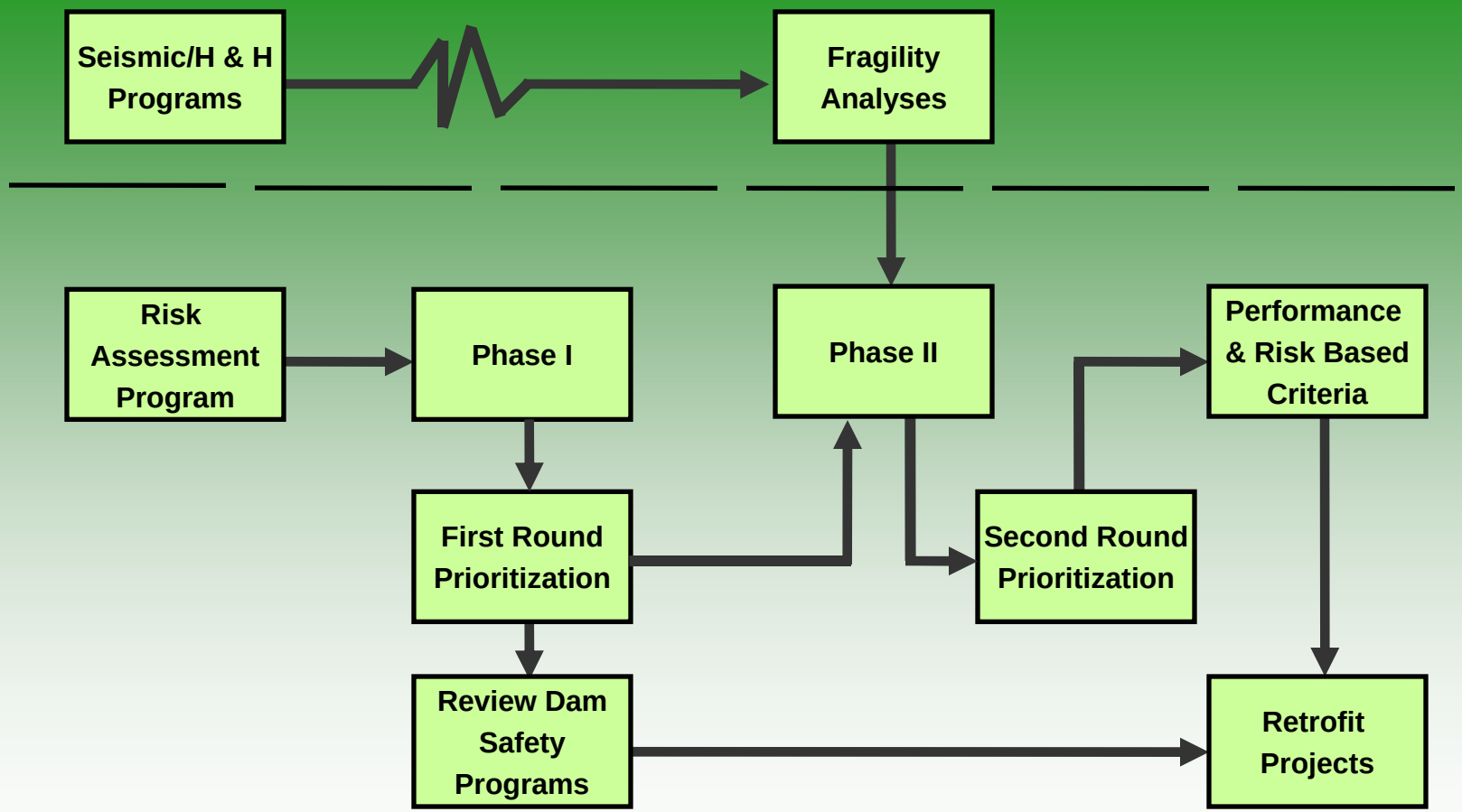
- 55 of 250+ high hazard dams instrumented
- Prioritized by annual PHA probability, potential for knowledge gain, and exposure to life-loss



Program Team

• Program Leader	**John Yen**
• Consultant	**Gregg Scott (USBR)**
• Consultant	**Dr. Zee Duron (HMC)**
• Geotechnical Lead	**Gene Hawkins**
• Seismic Lead	**Mike Knarr**
• Hydrology Lead	**Derick Dela Cruz**
• Instrumentation Lead	**John Stoessel**
• EAP Lead	**Terri Loun**

Program Logic
Integrating Risk Assessment Program and Seismic/H & H Programs



Program Costs and Milestone Schedule

1. Establish Program Plan	$ 20,000	2008
2. Summarize and review PFMA results	$ 40,000	2009
3. Phase I Risk Assessment	$ 60,000	2009
4. Phase II Risk Assessment	$ TBD	2010
5. Establish priorities	$ TBD	2010
6. “Performance Based Criteria”	$ TBD	2010
7. Review program with FERC, DSOD	$ TBD	2010
8. Final report	$ TBD	2011